MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

HBC1011 – BIOCHEMISTRY I

12 OCTOBER 2019
2:30 -4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **4 pages** (including the front page)
2. This paper consists of **5 Short Answer Type questions**. All questions carry equal marks (10 marks per question).
3. Answer **ALL QUESTIONS.**
4. Print your answers **clearly** and **neatly** in the Answer Booklet provided.
5. You may use calculator in this examination.

Question 1

A. What is a covalent bond? [1 mark]

B. Both cellulose and starch are homopolymers, which are formed by joining many identical glucose units. However, they have very different structures and functions. What are their functions? Explain briefly their biochemical difference. [1 mark]

C. What is the selective advantage of DNA over RNA as the genetic material? [1 mark]

D. Describe briefly THREE main principles in evolution process? [3 marks]

E. Explain why water forms nearly spherical droplets on the surface of a freshly waxed car. [1 mark]

F. What is the relation between the pKa of an acid and the strength of the acid? [1 mark]

G. Calculate the pH of a 200 mL solution of pure water to which has been added 50 mL of 1mM HCl. [2 marks]

Question 2

A. What is hydropathy? What is the effect of hydropathy on protein structure? [2 marks]

B. List ONE difference between globular and fibrous proteins. Give ONE example each. [2 marks]

C. Are all combination of ϕ and ψ angles in the peptide bond possible? Explain briefly your answer. [1 mark]

D. Name TWO types of protein chromatography for protein purification. [1 mark]

E. What is the purpose of using sodium dodecyl sulfate and β-mercaptoethanol in SDS-PAGE protein analysis? [2 marks]

F. Describe briefly ONE advantage and ONE disadvantage of cryo-electron microscopy for protein structure determination. [2 marks]

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Question 3

A. How does DNA double helix major groove involved in gene expression regulation? [1 mark]

B. Compare TWO differences between DNA replication and transcription. [2 marks]

C. What might happens if the genetic code is not degenerate? [1 mark]

D. List TWO approaches that measure expression of thousands of genes in a single experiment. [1 mark]

E. You are given a DNA coding strand. Draw the DNA template and mRNA with the correct orientation. [2 marks]

Coding strand: 5'-AGCGTCAGCT-3'

F. Define briefly molecular cloning. [1 mark]

G. What does conservative substitution mean in sequence alignment? [1 mark]

H. Explain why high sequence similarity sometimes does not necessarily imply homology. [1 mark]

Question 4

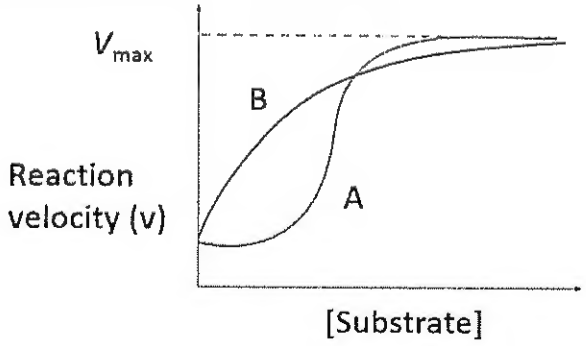
A. Describe briefly TWO biological roles of carbohydrates and give ONE example for each. [2 marks]

B. What are isomers? What is the common form of isomers found in amino acid and carbohydrates? [2 marks]

C. Compare TWO differences between enzymatic and chemical catalysis. [2 marks]

D. What is a cofactor and its function? Give ONE example. [2 marks]

E. Define allosteric enzyme and its binding properties. Identify the enzyme kinetic plotted with allosteric enzyme in figure below. [2 marks]



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Question 5

A. What is the effect of varying chain length and the degree of unsaturation on the properties of fatty acid and lipid? [1 mark]

B. Describe briefly FOUR features of biological membranes. [2 marks]

C. Compare the difference between primary and secondary active transport. [2 marks]

D. Draw a schematic diagram of a typical phospholipid molecule. [2 marks]

E. What are vitamins? List ONE example for fat-soluble and water soluble vitamins each. [2 marks]

F. In healthy mammalian tissue, the ratios of NAD^+/NADH and $NADP^+$/NADPH are important to maintain the redox state of a cell. Identify the predominant species in the cytoplasm. [1 mark]

End of paper